ENHANCE MICROALGAE

Interreg Atlantic Area
European Regional Development Fund

EUROPEAN UNION

Disruptive technologies for processing of microalgae biomass.

Prof Brijesh K Tiwari, Teagasc

La Rochelle, 20/10/2022

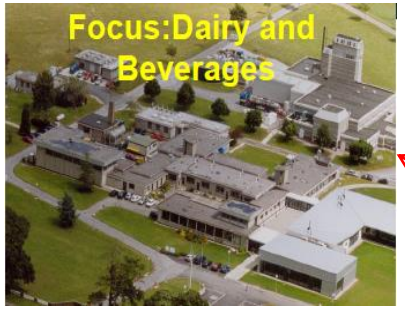
Teagasc –Agriculture and Food Development Authority

ENHANCE MICROALGAE

Interreg Atlantic Area
European Regional Development Fund

EUROPEAN UNION

- Animal and Grassland Research and Innovation
- Crops, Environment and Land Use
- **Food**
- Rural Economy and Development



Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

teagasc
Agriculture and Food Development Authority

Advisory offices	**52**
Teagasc colleges	**4**
Private colleges	**3**
Research centres	**7**

Disruptive technologies

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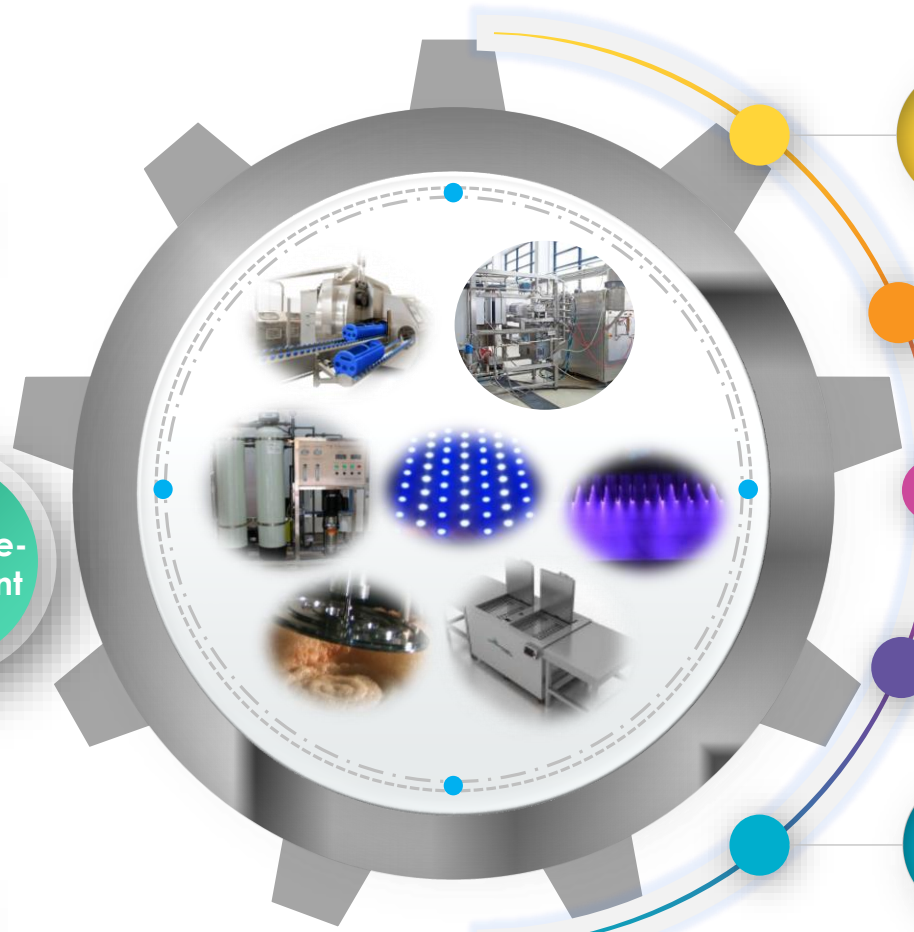
Conversion systems

Non-thermal processing

Novel Pre-treatment

Novel extraction



Enhanced recovery

Energy efficiency

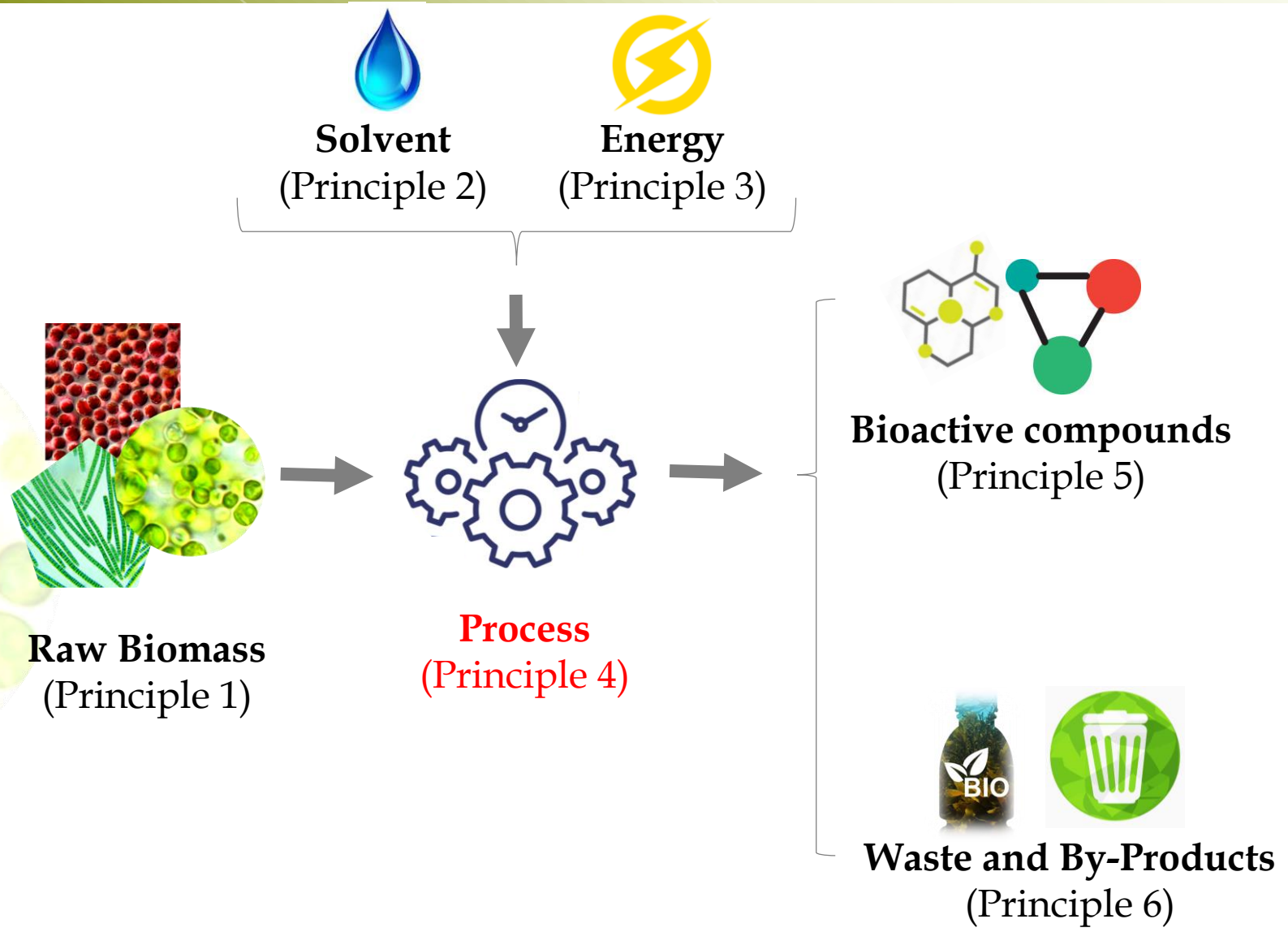
Nutritional attributes

Value addition

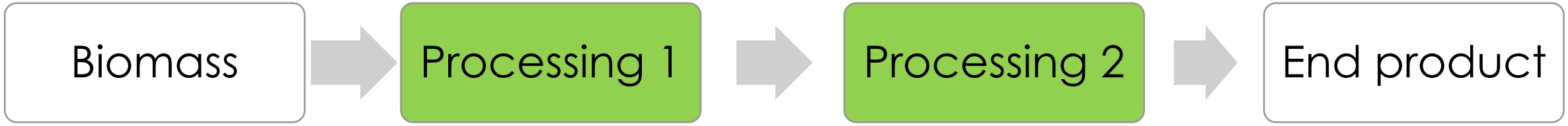
Waste utilisation

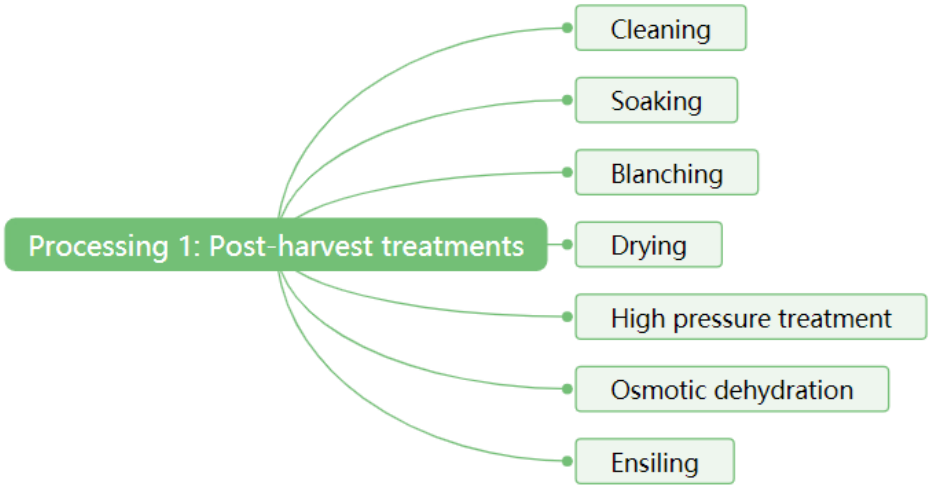
Principle of clean and green extraction techniques

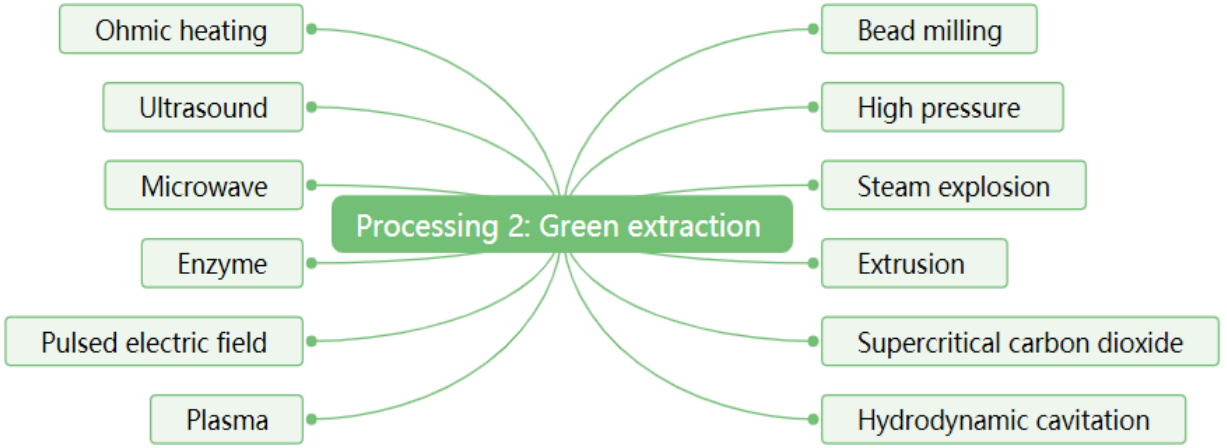
- Innovation by selection of varieties and use of renewable resources.
- Use of alternative solvents and principally water or agro-solvents.
- Reduce energy consumption by energy recovery and using innovative technologies.
- Production of co-products instead of waste to include the bio- and agro-refining industry.
- Reduce unit operations and favour safe, robust and controlled processes.
- Aim for a non denatured and biodegradable extract without contaminants.



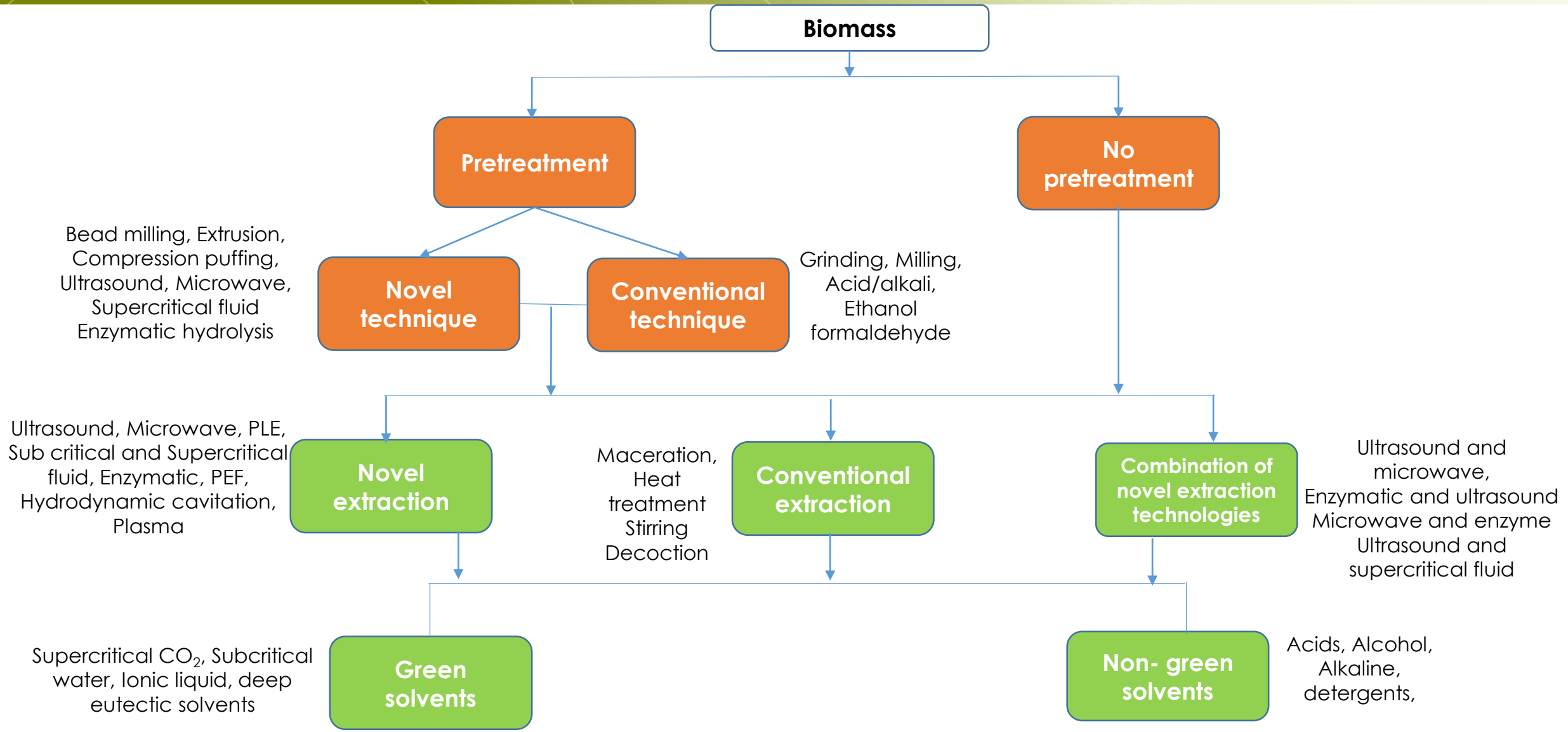
Energy efficient conversion systems





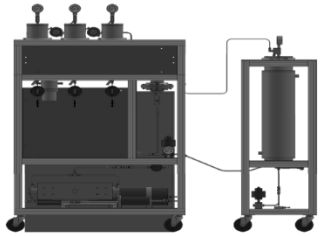


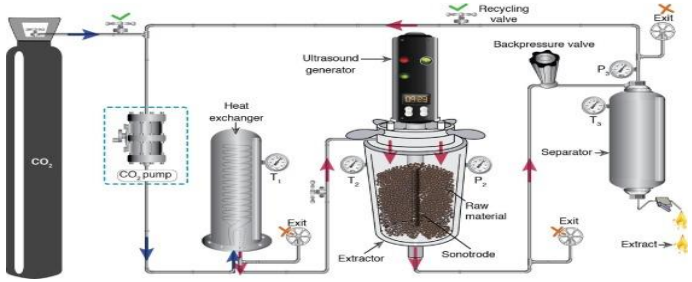
Pre-treatments



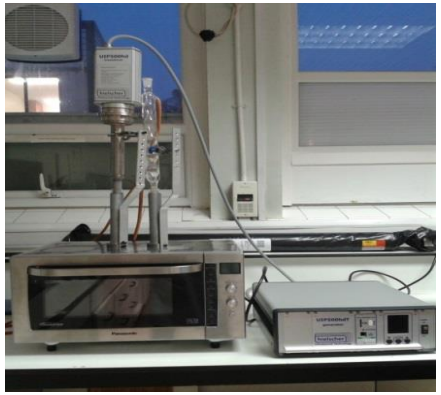
Extraction technologies

Cavitation technologies (US)



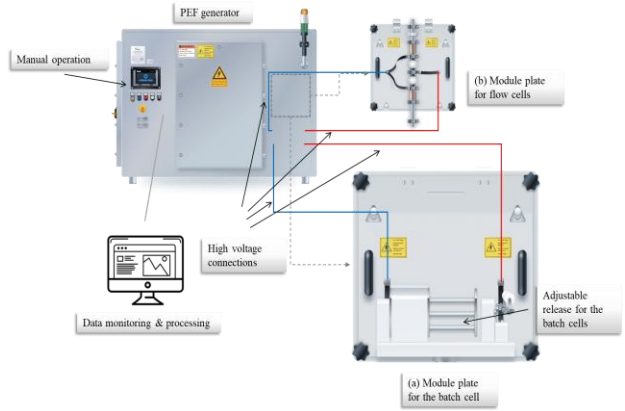


Supercritical fluid extraction (SCF) + Ultrasound



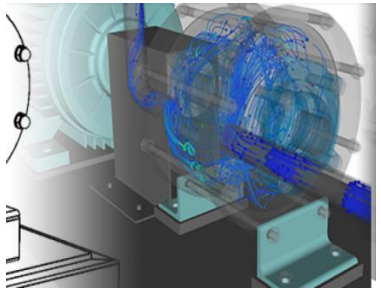
Microwave + Ultrasound Assisted Extraction

High Pressure Processing



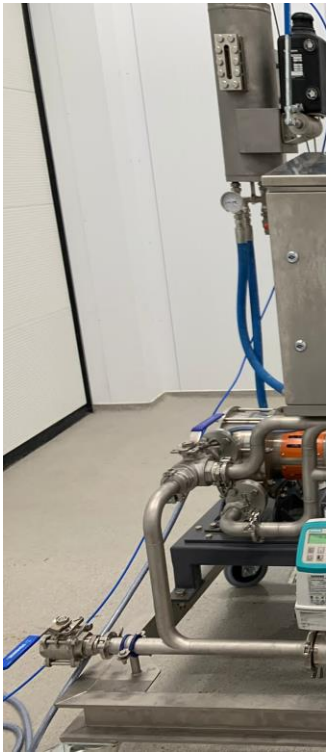
Pulsed Electric Field

Hydrodynamic cavitation

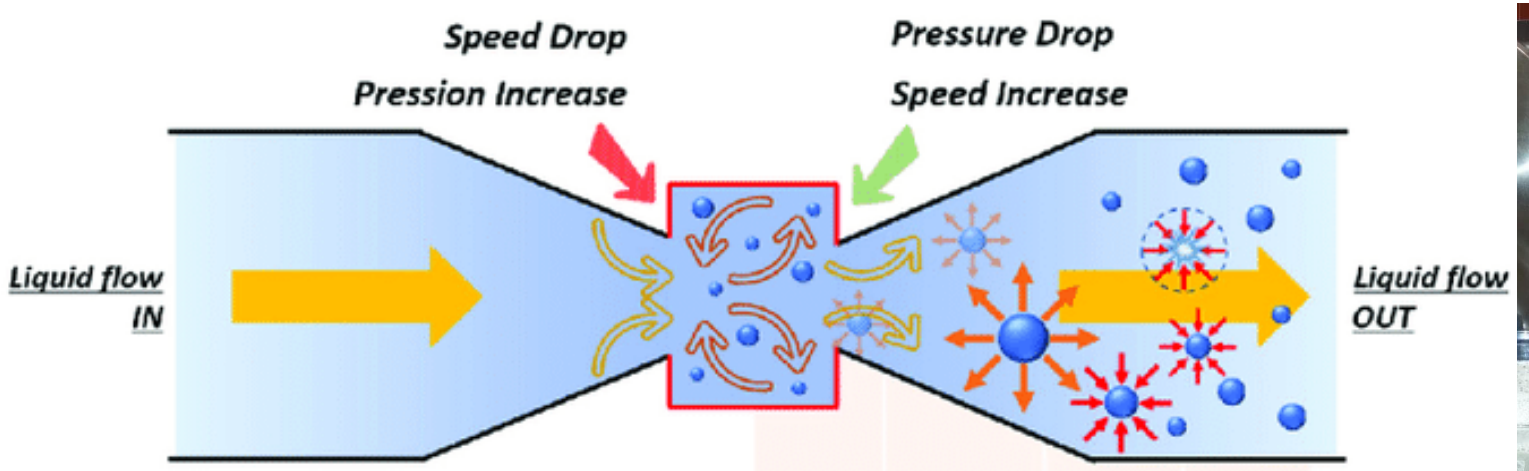


Rotor &
Stator

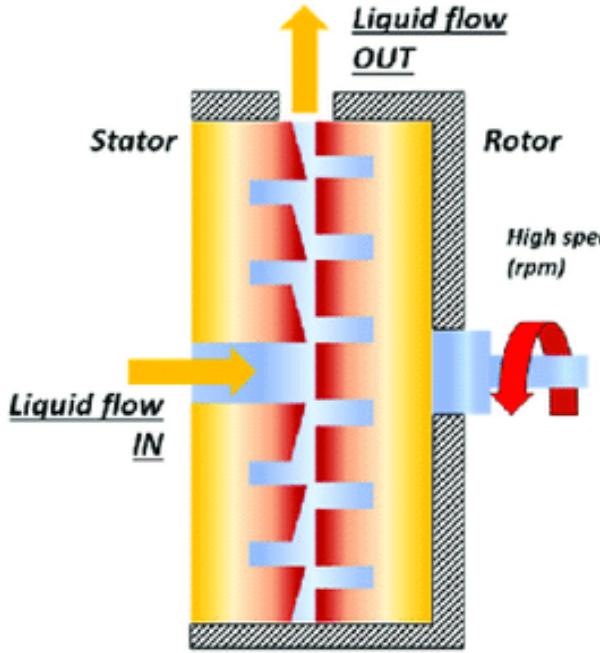
Hydrodynamic cavitation

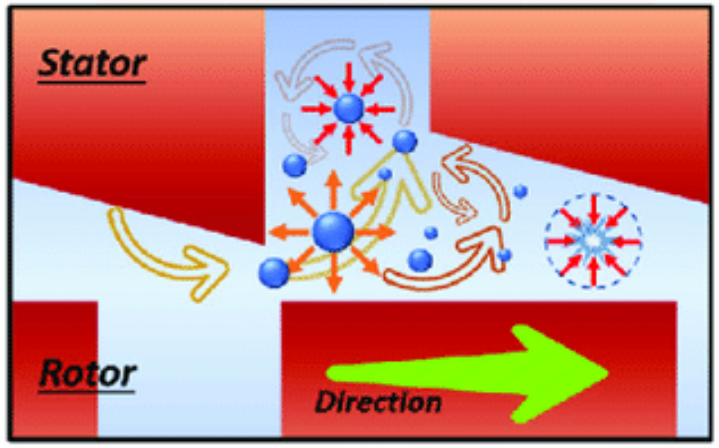


Venturi Effect

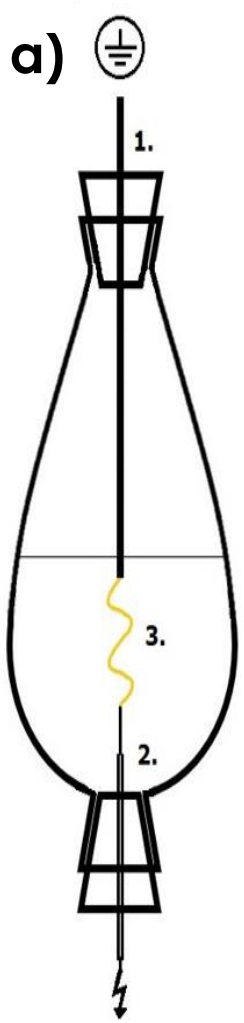


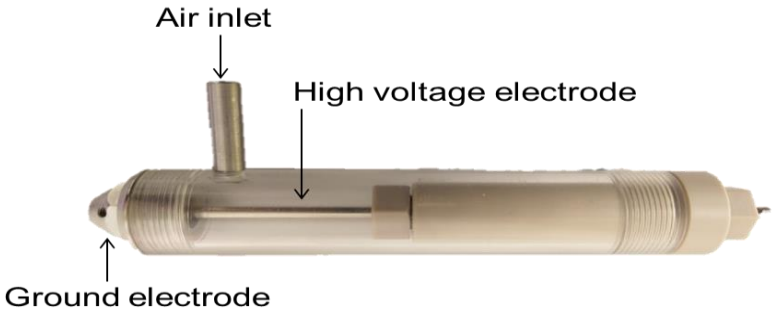
Rotor-stator System

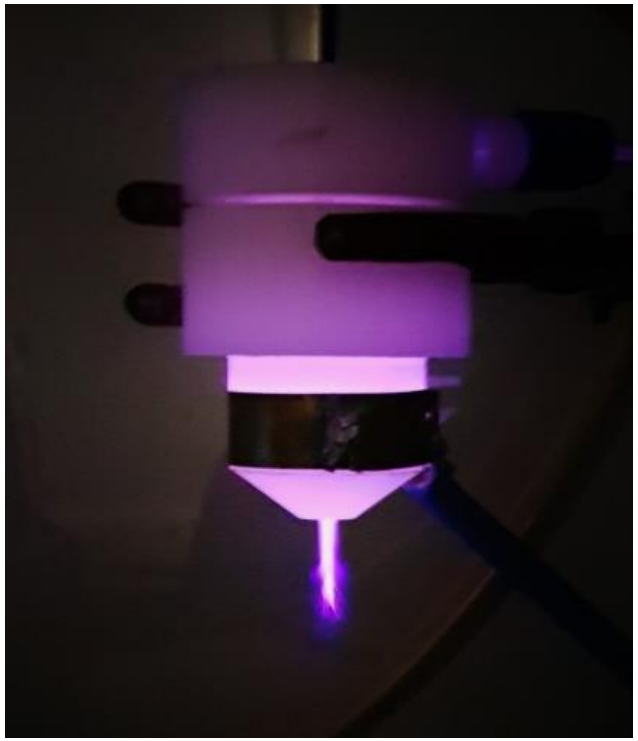




Plasma assisted extraction







Plasma jet system

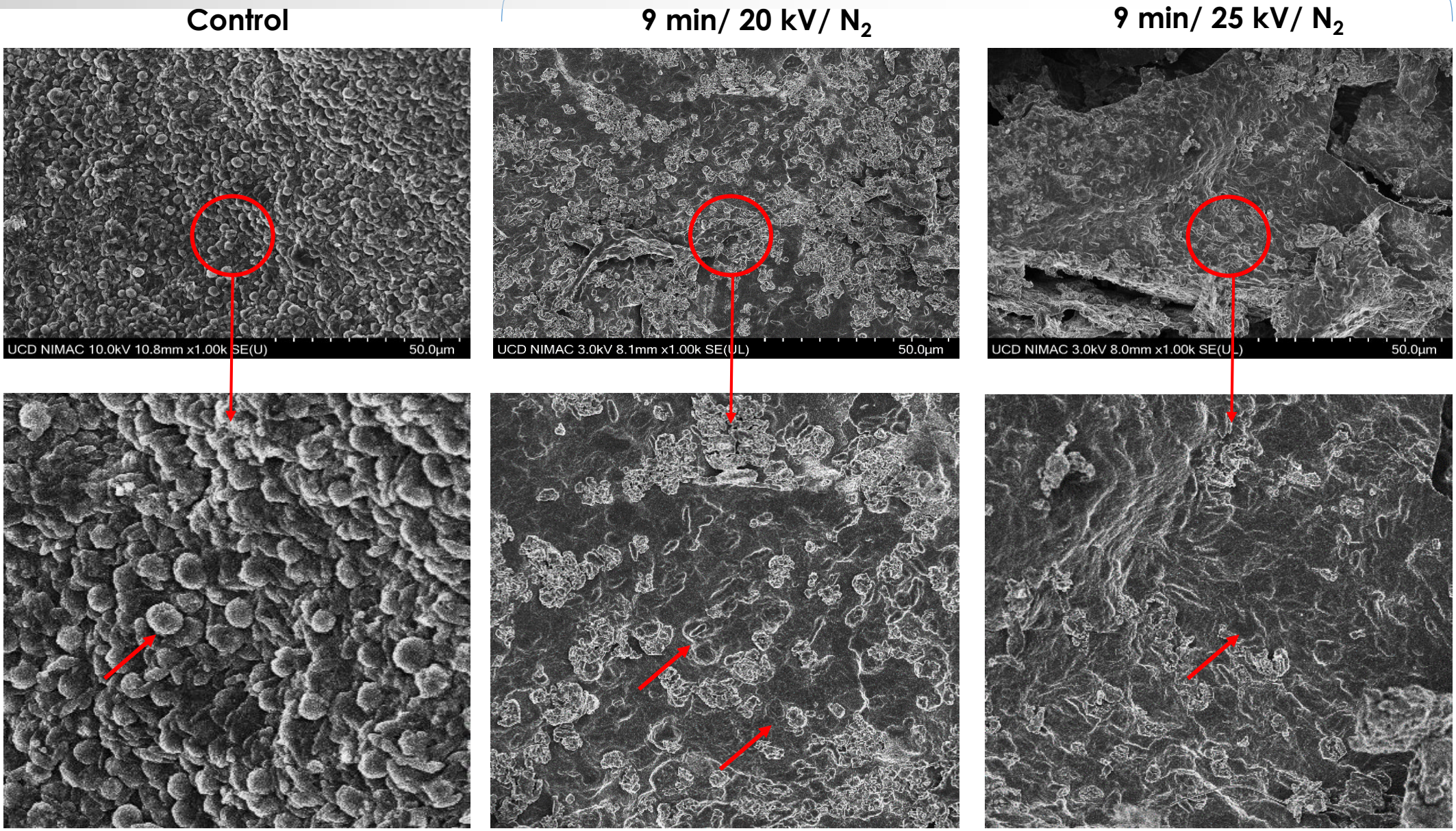
Voltage: 25 kV

Voltage: 20 kV

Hot plasma system

STSM funded by PlAgri

Scanning Electron Microscopy

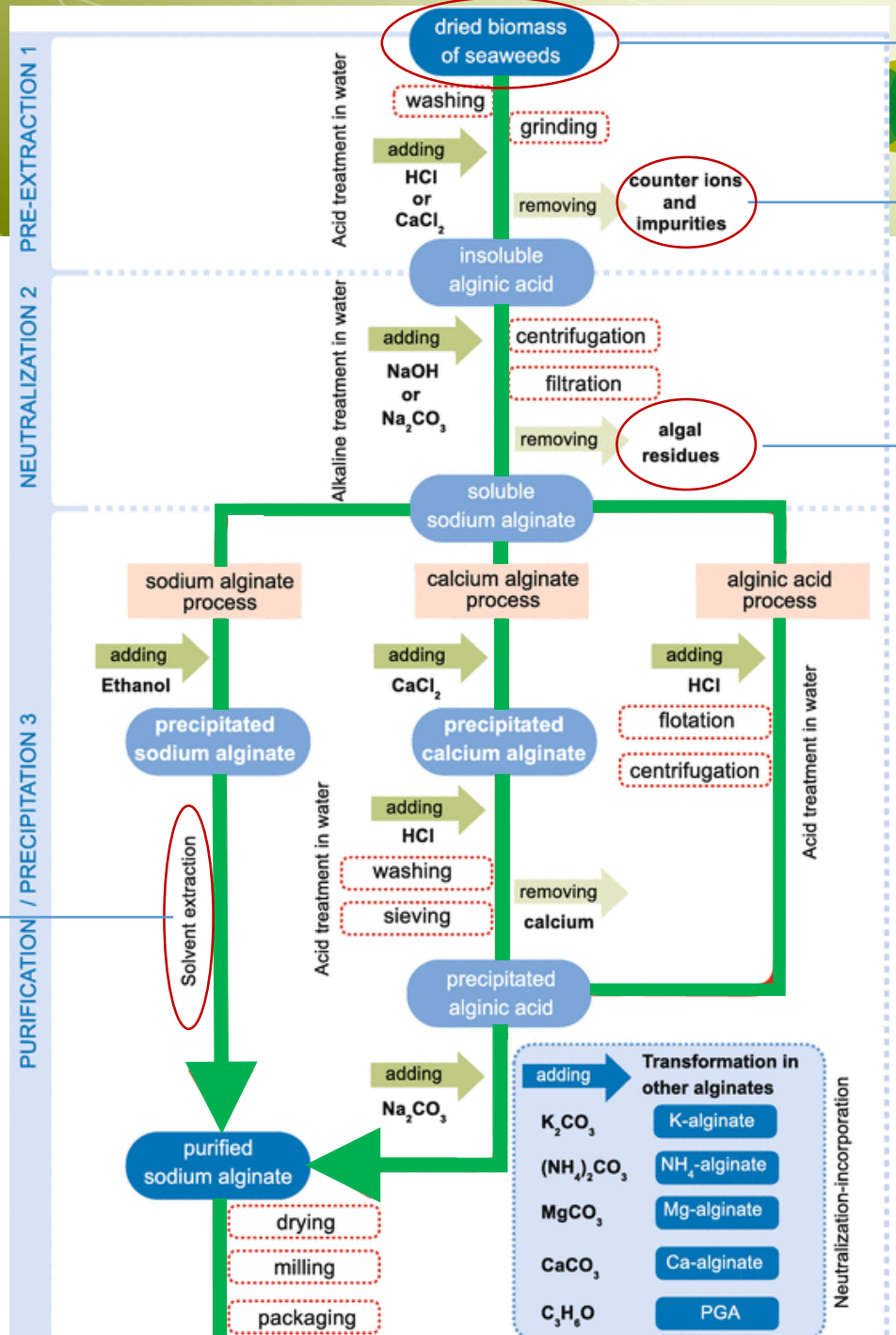


Biorefinery

Value Addition

Innovative approach
- Greening the process
- Zero waste approach
- Utilising every fraction

✓ Solvent replacement
✓ Membrane technology



✓ Energy efficient drying techniques
✓ Stabilising fresh biomass
✓ Utilising fresh biomass

✓ Laminarin (Value chain 1)
✓ Amino acids (flavour enhancers) (Value chain 2)
✓ Phlorotannins (Value chain 3)

✓ Proteins (Value chain 4)
✓ Algal fibre (Value chain 5)

Tiwari & Troy (2015), Seaweed Sustainability – Food and Non Food Applications, Elsevier


Thank you!
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